FIG. 3 depicts another problem presented by the existing Y-type steering linkage when the vehicle hits a bump in the road. As the suspension system compresses (arrow 42) to absorb the bump, the steering drag link 50 and steering tie rod 60 change position relative to one another, becoming more parallel. This increases the effective distance between the steering knuckles (not shown) at the ends of steering drag link 50 and steering tie rod 60 and therefore increases toe-out on the vehicle (represented by the arrows 46). These changes in vehicle orientation on bumpy terrain contribute to vehicle instability.

FIG. 4 depicts a steering linkage system 101 of the present invention which eliminates the noted problems to which existing steering systems are prone. A steering link (not shown) extends from the pitman arm 110 on the steering box of the vehicle (also not shown) back to a steering idler 120. This steering idler 120 provides a pivot which is substantially coincident with the frame pivot 132 of a wishbone 130, thereby minimizing relative motion between the steering idler 120 and the pitman arm 110 as the wishbone 130 is moved up and down throughout the vehicle's range of suspension travel, from full compression to full extension. A steering drag link 100 extends from the steering idler 120 to a steering bellcrank 140. The pivot of the steering bellcrank 140 is substantially coincident with the axle pivot of wishbone 130; therefore there is no relative motion between steering bellcrank 140 and steering idler 120 as wishbone 130 is moved up and down throughout the vehicle's range of suspension travel. Tie rods 150 extend from steering bellcrank 140 to each of the steering knuckles (not shown). In this manner, there is no relative motion between

steering knuckles (not shown) and steering bellcrank 140, as they all attach to axle 40 via the frame pivot 132 and mounting plate 134.

It is not necessary that the steering idler 120 be coupled by a pivot on the wishbone 130. In an alternative embodiment, a sliding idler would be equivalent in result to the pivoted idler 120. This is because the idler is used to transmit motion from pitman arm 110 to the bellcrank 140 via the steering link and steering drag link 100. All that is required is that the idler be unaffected by motion of the wishbone. This result can be accomplished equally well by the idler 120, whether its coupling to the wishbone 130 is by means of a pivot or a slider.

With this system, all relative motion between linkage components is eliminated by making all relative pivot points substantially coincident with one another. Bump-induced toe change and bump-induced steering change are therefore completely eliminated.

This wishbone linkage can attach in one of two ways: two attachment points on the vehicle frame 142 and one attachment point on the axle 40 (as shown in FIG. 4) or reversed, with one attachment point on the frame and two attachment points on the axle. This wishbone linkage may also be located either on the top of the axle (as shown), or on the bottom of the axle utilizing upper suspension arms instead of lower suspension arms. The combination of two suspension arms and one wishbone allows control of the axle location in all axes without any translation due to axle suspension compression and articulation.

FIG. 5 illustrates another embodiment 102 of the present invention. Rather than using a single wishbone link, such as the wishbone 130 in FIG. 4, this embodiment incorporates two independent upper suspension arms 200 connected to frame 142. This embodiment could also be deployed as lower suspension arms 200'. By angling suspension arms 200 significantly inward toward axle 40, the suspension arms 200 provide an axle-centering feature similar to the wishbone configuration depicted in FIG. 4. An alternative configuration could have upper suspension arms 200 substantially parallel and lower suspension arms 200' angled in relation to axle 40. The steering linkage is very similar to that in FIG. 4, as the pivots of the steering idler 120 and the steering bellcrank 140 coincide with the pivots of a single suspension link.

Yet another alternative configuration (not shown) involves leaving commonly occurring, stock multi-link setup, such as is shown in Fig. 1 (with two upper suspension arms 10, two lower suspension arms 20, and a track bar 30), but replacing the steering links 50 and 60 with a linkage system similar to that in FIG. 5. Such a configuration would have the pivots coinciding with one of the suspension arms (10 or 20) and the problems with bump-induced toe change and bumpsteer are eliminated, although bump-induced yaw would remain.

Although there have been described hereinabove various specific arrangements of a AUTOMOTIVE STEERING AND SUSPENSION SYSTEM in accordance with the invention for the purpose of illustrating the manner in which the invention may be used to advantage, it will be appreciated that the invention is not limited